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Prostomium Morphology as a Criterion for the Identification of Nephtyid Polychaetes (Annelida: Phyllodocida), with Reference to the Taxonomic Status of *Aglaophamus neotenus*

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With 1 Text-figure

Abstract The morphology of the prostomium is suggested as a taxonomic character in Nephtyidae. In the present study, the prostomium morphology of eight species of *Nephtys* (*N. australiensis*, *N. gravieri*, *N. semiverrucosa*, *N. inornata*, *N. mesobranchia*, *N. oligobranchia*, *N. polybranchia* and *N. sukumoensis*) which show replacement of barred (laddered) setae was examined. Characteristics of the shape of the antennae and their position were used to divide these species into two groups, one consisting of the first three species and the other, the remaining five species. The two groups are suggested to have different phylogenetic origins. The present study also suggested that *Aglaophamus neotenus* should be placed in *Nephtys* as *Nephtys neotena* new combination.

For more than a century, the taxonomy of nephtyid polychaetes has been based mainly on the morphology of the parapodia and the proboscis (Hartman, 1950). The morphology of the prostomium has been said to have doubtful taxonomic value (Day, 1967) and its importance does not seem to have been recognized among taxonomists. Ohwada (1983) found that prostomium morphology did not change during the growth of juveniles after first appearance of the prostomium at metamorphosis, and demonstrated the importance of prostomium morphology for the identification of juvenile nephtyids. He further suggested that the inclusion of prostomium morphology in the criteria for the identification of adult nephtyids would contribute to more accurate identification and, therefore, facilitate the solution of some taxonomic problems in Nephtyidae.

In *Nephtys*, there is one easily distinguishable group of species in which barred (laddered) setae are replaced by non-barred setae in the posterior part of the body. Eight species have been reported so far in this group: *Nephtys australiensis* Fauchald, 1965; *N. inornata* Rainer et Hutchings, 1977; *N. gravieri* Augener, 1913; *N. mesobranchia* Rainer et Hutchings, 1977; *N. oligobranchia* Southern, 1921; *N. polybranchia* Southern, 1921; *N. semiverrucosa* Rainer et Hutchings, 1977 and *N. sukumoensis*

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Kitamori, 1960. Following Rainer & Hutchings (1977), *N. mirocirris* Fauchald, 1965 is considered synonymous with *N. gravieri* Augener, 1913. One more species belonging to this group seems to have been erroneously described under a different genus as *Aglaophamus neotenus* Noyes, 1980. In spite of this distinct difference from other *Nephtys* in distribution of setal types, these species have not been considered as a taxonomically-similar group. In this paper, the prostomium morphology of these species is reviewed to clarify their taxonomic relationship to each other, and the appropriate taxonomic placement of *Aglaophamus neotenus* is determined.

Material examined. The present study is based on the following specimens. (AM: Australian Museum, USNM: United States National Museum.)

Nephtys australiensis —Port Vincent, Yorke Peninsula, South Australia, Australia (AMW3783, Holotype), —Careel Bay, New South Wales, Australia (AMW5257). *N. gravieri* —Woodmans Point, South of Fremantle, Western Australia, Australia (AMW8177). *N. inornata* —Gunnamatta Bay, Port Hacking, New South Wales, Australia (AMW8706, Holotype; AMW8710, Paratype). *N. mesobranchia* —Calliope River, Gladstone, Queensland, Australia (AMW8653, Holotype). *N. oligobranchia* —northern coast of China (uncatalogued). *N. polybranchia* —northern coast of China, —Misaki, Miura Peninsula, Kanagawa, Japan, —Nebama Beach, Otsuchi Bay, Iwate, Japan (uncatalogued). *N. semiverrucosa* —Fannie Bay, Darwin, Northern Territory, Australia (AMW5865, Holotype), —Moreton Bay, Queensland, Australia (AMW19063). *Aglaophamus neotenus* —Wentworth Point, Damariscotta River, Maine, U.S.A. (USNM47166, Paratypes). The type specimen of *N. sukumoensis* was found to have been lost (Kitamori, personal communication) and no other specimen of this species has been reported so far.

Prostomium Morphology

The morphology of the prostomium and first and second setiger of the above mentioned nine species is summarized in Fig. 1. All figures are based on specimens whose proboscis did not protrude.

The figure of the prostomium of *N. inornata* in its original description (Rainer & Hutchings, 1977) is of the holotype (AMW8706) whose prostomium appears to be deformed. Figure 1–E is drawn on the basis of a paratype (AMW8710). The figure of the prostomium of *N. sukumoensis* (Fig. 1–I) is taken from its original description (Kitamori, 1960).

Figure 1 shows that the eight species of *Nephtys* can easily be divided into two groups on the basis of the morphology of the anterior end; i.e., Group I (*N. australiensis*, *N. gravieri* and *N. semiverrucosa*) and Group II (*N. inornata*, *N. mesobranchia*, *N. oligobranchia*, *N. polybranchia* and *N. sukumoensis*). Group I (Fig. 1 A–C) is characterized by possession of relatively tapering antennae with the second pair of antennae placed well behind the first pair on the ventral side of the prostomium, and by a markedly wide or flattened first setiger. In Group II (Fig. 1 E–I), the two pairs of antennae are both constricted at the base and at the distal part and are located close together on the anteroectal margins of the prostomium. The first setiger is neither wide nor flattened in Group II.

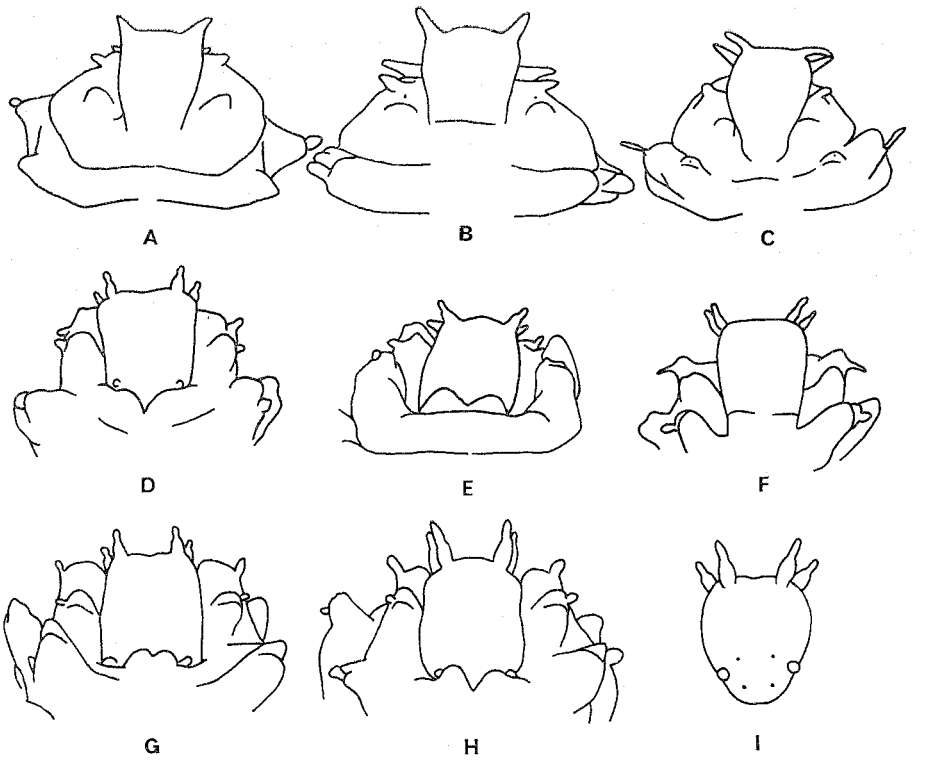

Fig. 1. Prostomium and first and second setiger (setae omitted). A. *Nephtys australiensis* (AMW 5257); B. *N. gravieri* (AMW 8177); C. *N. semiverrucosa* (AMW 19063); D. *Aglaophamus neotenus* (USNM 47166); E. *N. inornata* (AMW 8710); F. *N. mesobranchia* (AMW 8653); G. *N. oligobranchia* (from China); H. *N. polybranchia* (from Misaki); I. *N. sukumoensis* (Kitamori, 1960-prostomium only).

Taxonomic Status of *Aglaophamus neotenus*

To determine the correct genus for his new species, Noyes (1980) applied the criteria used by Fauchald (1968, 1977) to separate the four genera of Nephtyidae. Based on the presence of the interramal cirri, which, he thought, showed a slight but definite involution, the presence of curved acicular tips, two pairs of antennae, ornamentation of the proboscis and the lack of eversible digitiform nuchal processes, he placed his neotenic species in *Aglaophamus*. *Micronephtys* lacks interramal cirri, and *Inermonephtys* lacks proboscidal papillae. The possession of involute interramal cirri and curved acicular tips in this species are usually considered characteristics of *Aglaophamus*.

It was, however, found that the interramal cirri of juveniles of *N. caeca* and *N. polybranchia* had a slightly involute appearance during the process of development to adult recurved interramal cirri (Ohwada, unpublished observation). Further, the present examination of the paratypes of *Aglaophamus neotenus* showed that interramal cirri were slightly recurved in setigers around the middle of the body, where the

interramal cirri were best developed. Since this species is a neotenic species (Noyes, 1980), the slightly involute appearance of most of the interramal cirri does not negate the choice of *Nephtys*, which has recurved interramal cirri, as the correct genus for this species.

Curved acicular tips have been recognized in all of the eight species examined in the present study. *N. sukumoensis* was described to have curved acicular tips (Kitamori, 1960), contrary to Fauchald (1968, 1977) who described the tip of the aciculum in *Nephtys* as straight and blunt. In *N. caeca*, acicula were observed to change from curved-tipped to blunt-tipped form as the juvenile grew. With growth, the shaft of the aciculum thickened without thickening of the curved tip and, as a result, the curved tip became practically negligible in size compared to the thick straight shaft (Ohwada, 1983). The presence of curved acicular tips in the neotenic species, therefore, does not exclude *Nephtys* as the correct genus for this species.

So far, no *Aglaophamus* except for *Aglaophamus neotenus* has been reported to show the replacement of barred setae, whereas the above mentioned eight species of *Nephtys* are known to show replacement. The present study, on the other hand, revealed close similarity in prostomium morphology between *Aglaophamus neotenus* (Fig. 1–D) and the Group II species (Fig. 1 E–I). In all of these species, two pairs of antennae are constricted at the base and at the distal part, and are located close together on the anterior corners of the prostomium. Since it has been shown by Ohwada (1983) that prostomium morphology does not change during the growth of the juvenile after first appearance of the prostomium at metamorphosis, it would be reasonable to relate *Aglaophamus neotenus*, a neotenic species, to Group II, and place this species in *Nephtys* as below:

Nephtys neotena comb. nov.

Aglaophamus neotenus Noyes, 1980, pp. 106–108, figs. 1–2.

Observations of the paratypes of *N. neotena* in the present study differ from the original description by Noyes (1980) as follows; Small notopodial cirri begin on the first setiger rather than the second setiger. There are 20 or 22 rows of subdistal papillae rather than 18 rows behind the distal papillae on the proboscis.

Discussion

In Nephtyidae, little attention has been paid so far to prostomium morphology. Although the exact shape of the prostomium can not be observed when the proboscis is everted, this is no reason to exclude prostomium morphology from the criteria for the identification of nephtyid polychaetes since prostomium morphology does not change during growth whereas the shape of the parapodium, the main diagnostic character, changes not only during growth (Ohwada, 1983) but also along the length of the body (Fauchald, 1977). The inclusion of prostomium morphology in the diagnostic criteria will help prevent erroneous identification of both juveniles and

adults. Misidentification can be inferred, for example, where two different prostomia are described under the same species name; e.g. *N. longosetosa* Örsted in Hartmann-Schröder (1971) and in Fauchald (1963). The inclusion of a description and a figure of the prostomium is strongly recommended in the original description of species.

In the present study, the nine species of nephtyid polychaetes which show the replacement of barred setae are divided into two groups on the basis of prostomium morphology. These two groups can also be distinguished on the basis of the position of the interramal cirri; in Group I, they occur from setiger 3–4, and in Group II, from setiger 5–8. In Group I, postacicular lamellae are greatly elongated in both rami and are somewhat auricular with an erect lobe on the dorsal border of the neuropodium, whereas they are not distinctively developed in Group II. (As for *Nephtys* species which lack replacement of barred setae, the question is still open as to whether the parapodial correlates of each group defined on the basis of prostomium morphology apply to them or not.)

In regard to the geographical distribution of each group, Group I show a wide distribution in the Indo-West Pacific (Kitamori, 1960; Fauchald, 1968; Rainer & Hutchings, 1977), except for *N. neotena* which was described from the east coast of North America (Noyes, 1980). Group II, on the other hand, have been reported only from Australia (Rainer & Hutchings, 1977) except for a report of *N. gravieri* from the Bay of Bengal, India (Fauvel, 1932). However, this reported occurrence of *N. gravieri* in the Bay of Bengal is questionable (Paxton, 1974).

If the morphological similarities in each group are reflection of systematic closeness, then, the above mentioned nine species can be said to have two phylogenetic origins, and this influence that their phylogenetic origins differ is supported by the difference in the distribution pattern of the two groups.

It is also noteworthy that five of these species (*N. australiensis, N. gravieri, N. semiverrucosa, N. inornata* and *N. mesobranchia*) are among the seven species of *Nephtys* distributed in Australia and all of these five species (for *N. gravieri* see Paxton (1974) as indicated above) have been recorded only from Australia. As a result, the species of nephtyid polychaetes occurring in Australia are dominated by those showing replacement of barred setae.

As Rainer & Hutchings (1977) pointed out, insufficient attention has been paid in early descriptions to the distribution of the various types of setae along the body. Thus, future studies may reveal species other than those examined here which show replacement of barred setae.

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References

Augener, H. 1913. Polychaeta I, Errantia. In: Die Fauna Südwest-Australiens. Ergebnisse der Hamburger südwest-australischen Forschungsreise 1905. ed. by Michaelsen, J.W., and Hartmeyer, R. Fischer, Jena, 4: 65–304.

Day, J.H. 1967. A monograph on the Polychaeta of Southern Africa. Part I. Errantia. British Museum (Natural History), London, Publication No. 656, 458pp.

Fauchald, K. 1963. Nephtyidae (Polychaeta) from Norwegian waters. Sarsia, 13: 1–32.

————. 1965. Some Nephtyidae (Polychaeta) from Australian waters. Rec. Australian Mus., 26: 333–339.

————. 1968. Nephtyidae (Polychaeta) from the Bay of Nha Trang, South Viet Nam. In: Naga Report, Scientific Results of Marine Investigations of the South China and the Gulf of Thailand, 1959–1961. 4(3): 1–33. University of California, Scripps Institution of Oceanography, La Jolla, California.

————. 1977. The polychaete worms. Definitions and keys to the orders, families and genera. Science Series 28, Natural History Museum of Los Angeles County in conjunction with the Allan Hancock Foundation, University of Southern California, 188pp.

Fauvel, P. 1932. Annelida Polychaeta of the Indian Museum, Calcutta. Mem. Indian Mus., Calcutta, 12: 1–269.

Hartman, O. 1950. Polychaetous annelids. Goniadidae, Glyceridae, and Nephtyidae. Allan Hancock Pacific Expeditions No. 15: 1–181.

Hartmann-Schröder, G. 1971. Annelida, Borstenwürmer, Polychaeta. Tierwelt Deutschlands, 58: 1–594.

Kitamori, R. 1960. Two new species of Cirratulid and Nephthydidae (Annelida: Polychaeta). Bull. Japan. Soc. Sci. Fish., 26: 1082–1085.

Noyes, G.S. 1980. The biology of *Aglaophamus neotenus* (Polychaeta: Nephtyidae), a new species from Maine and Canada. Biol. Bull., 158: 103–117.

Ohwada, T. 1983. The identification of juveniles of nephtyid polychaete and their ecology with special reference to settling seasons. M.Sc. Thesis, University of Tokyo, 45pp.

Paxton, H. 1974. Contributions to the study of Australian Nephtyidae (Polychaeta). Rec. Australian Mus., 29: 197–208.

Rainer, S., & P. Hutchings. 1977. Nephtyidae (Polychaeta: Errantia) from Australia. Rec. Australian Mus., 31: 307–347.

Southern, R. 1921. Polychaeta of the Chilka Lake and also of fresh and brackish waters in the other parts of India. Mem. Indian Mus., Calcutta, 5: 563–659.